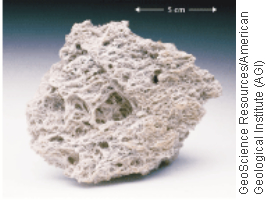
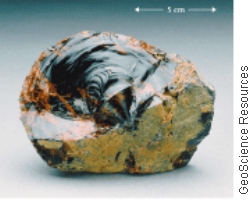
**Chapter 3, Section 1**

**Rocks**

**A** [**rock**](javascript:openGlossaryWnd('e_ga_06_rock')) **is any solid mass of mineral or mineral-like matter that occurs naturally as part of our planet.** A few rocks are composed of just one mineral. However, most rocks, like granite, occur as solid mixtures of minerals. A characteristic of rock is that each of the component minerals retains their properties in the mixture. A few rocks are composed of nonmineral matter. Coal is considered a rock even though it consists of organic material. Obsidian and pumice, shown in Figure 1, are volcanic rocks that do not have a crystalline structure.



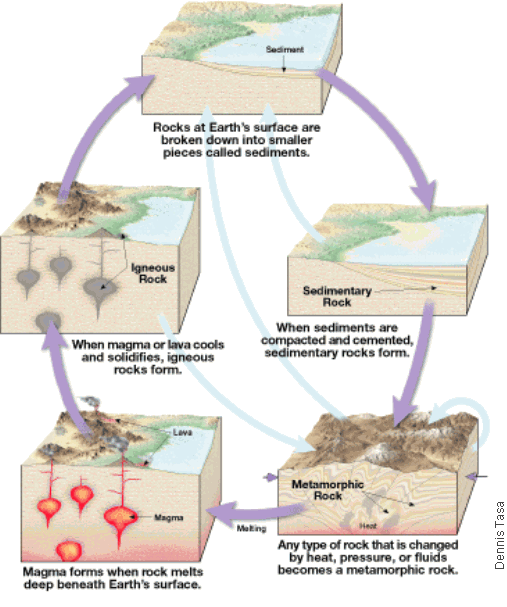
**Figure 1 A** Obsidian and **B** pumice are two examples of rocks that do not have a crystalline structure.

Rocks are classified into three groups based on how they were formed. **The three major types of rocks are igneous rocks, sedimentary rocks, and metamorphic rocks.** Before examining each group, you will look at a model for the rock cycle, which is the process that shows the relationships between the rock group

**The Rock Cycle**

Earth is a system. It consists of many interacting parts that form a complex whole. **Interactions among Earth’s water, air, and land can cause rocks to change from one type to another. The continuous processes that cause rocks to change make up the** [**rock cycle**](javascript:openGlossaryWnd('e_ga_06_rockcycle'))**.** Most changes in the rock cycle take place over long periods of time.

Figure 2 shows some key events in the rock cycle. Refer to the figure throughout this section as you examine how rock might change over time. Look at Figures 2A and 2B. [**Magma**](javascript:openGlossaryWnd('e_ga_06_magma')) is molten material that forms deep beneath Earth’s surface. **When magma cools and hardens beneath the surface or as the result of a volcanic eruption,** [**igneous rock**](javascript:openGlossaryWnd('e_ga_06_igneousrock')) **forms.** Magma that reaches the surface is called [**lava**](javascript:openGlossaryWnd('e_ga_06_lava')).



**Figure 2** The rock cycle consists of many processes that change Earth’s rocks. **Formulating Hypotheses** Can a sedimentary rock become an igneous rock without changing first to a metamorphic rock? Explain.

What will happen if an igneous rock that formed deep within Earth is exposed at the surface? Any rock at Earth’s surface, including the granite shown in Figure 3, will undergo weathering. [**Weathering**](javascript:openGlossaryWnd('e_ga_06_weathering')) is a process in which rocks are physically and chemically broken down by water, air, and living things. These weathered pieces of earth materials are [**sediments**](javascript:openGlossaryWnd('e_ga_06_sediment')). Sediments are often moved by water, gravity, glaciers, or wind. **Eventually, sediments are compacted and cemented to form** [**sedimentary rock**](javascript:openGlossaryWnd('e_ga_06_sedimntryroc'))**, as shown in Figure 2C and 2D.**

 **Figure 3 El Capitan in Yosemite National Park** This granite was once buried deep beneath Earth’s surface. Now that it is exposed, it will eventually weather and form sediments.

If the sedimentary rocks become buried deep within Earth, they will be subjected to increases in pressure and/or temperature. **Under extreme pressure and temperature conditions, sedimentary rock will change into** [**metamorphic rock**](javascript:openGlossaryWnd('e_ga_06_metamorprock'))**, as shown in Figure 2E.** If the metamorphic rocks are subjected to additional pressure changes or to still higher temperatures, they may melt to form magma. The magma will eventually crystallize to form igneous rock once again.

**Alternate Paths**

The purple arrows in Figure 2 show only one way in which an igneous rock might form and change. Other paths are just as likely to be taken as an igneous rock goes through the rock cycle. The blue arrows show a few of these alternate paths.

Suppose, for example, that an igneous rock remained deeply buried. Eventually, the rock could be subjected to strong forces and high temperatures such as those associated with mountain building. Then, the igneous rock could change into one or more kinds of metamorphic rock. If the temperatures and pressures were high enough, the igneous rock could melt and recrystallize to form new igneous rock.

Metamorphic and sedimentary rocks, as well as sediment, do not always remain buried. Often, overlying rocks are stripped away, exposing the rock that was once buried. When this happens, the rocks weather to form sediments that eventually become sedimentary rocks. However, if the sedimentary rocks become buried again, metamorphic rocks, like those used for the roof tiles in Figure 4, will form.



**Figure 4** The roof on this house is made of slate. Slate is a metamorphic rock that forms from the sedimentary rock shale. **Explaining** How can shale become slate?

Where does the energy that drives Earth’s rock cycle come from? **Processes driven by heat from Earth’s interior are responsible for forming both igneous and metamorphic rocks. Weathering and the movement of weathered materials are external processes powered by energy from the sun. External processes produce sedimentary rocks.**

**SECTION 3.1 Assessment** Answer on lined paper!

**Reviewing Concepts**

(1)What is a rock?

(2)What are the three major types of rocks?

(3)How do igneous, sedimentary, and metamorphic rocks differ?

(4)What is the rock cycle?

(5)What powers Earth’s rock cycle?

**Critical Thinking**

(6) **Comparing And Contrasting** Compare and contrast igneous and metamorphic rocks.

(7) **Applying Concepts** How might a sedimentary rock become an igneous rock?

(8) **Applying Concepts** List in order the processes that could change one sedimentary rock into another sedimentary rock.